**Biological Evaluation**

**For**

**Regional Foresters Sensitive Species**

**VDOT - Route 33 Rawley Pike Road Improvement**

**Rockingham County, Virginia**

**North River Ranger District**

**George Washington and Jefferson National Forests**

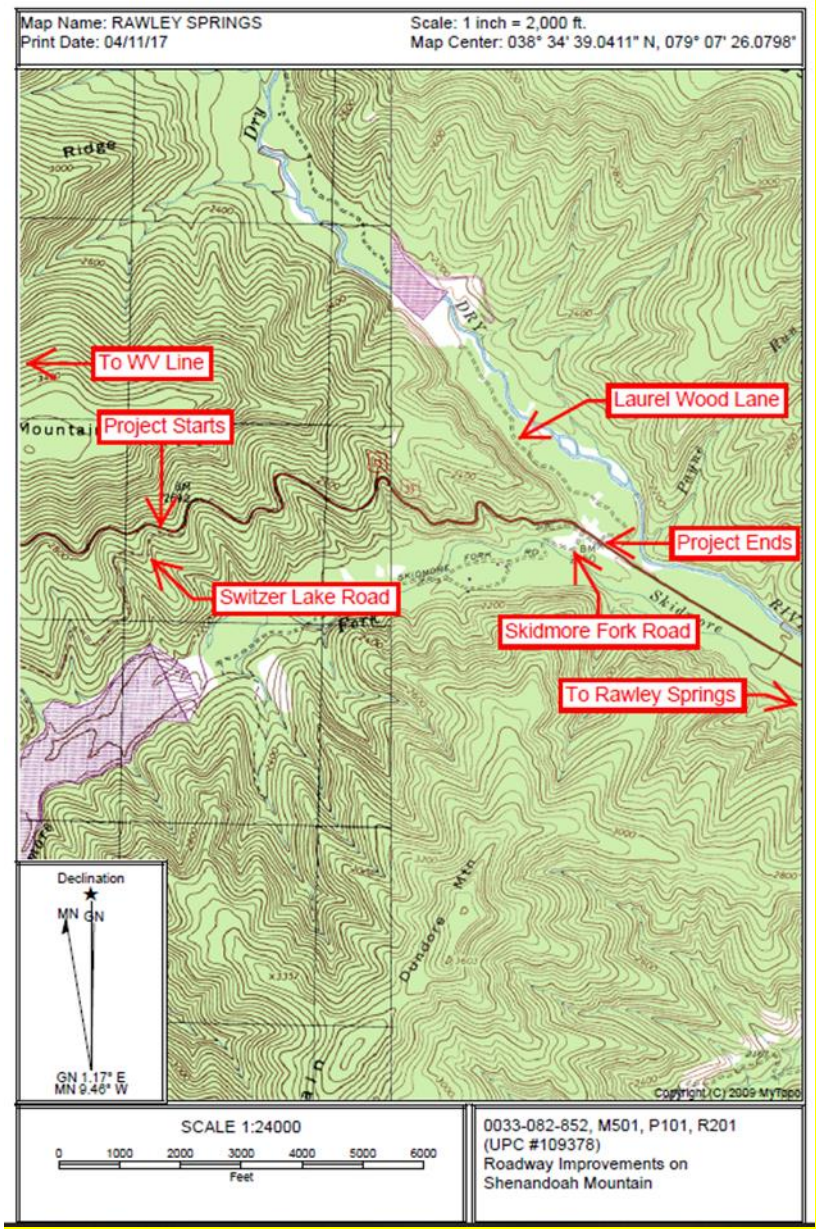
## Introduction

Forest Service Manual (FSM) Section 2672.41 requires a biological evaluation (BE) and/or biological assessment (BA) for all Forest Service planned, funded, executed, or permitted programs and activities. The objectives of this Biological Evaluation (BE) are to: 1) ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native species or contribute to trends toward federal listing, 2) comply with the requirements of the Endangered Species Act (ESA) so that federal agencies do not jeopardize or adversely modify critical habitat (as defined in ESA) of federally listed species, and 3) provide a process and standard to ensure that Regional Forester's Sensitive species receive full consideration in the decision-making process using the best available science.

The North River Ranger District supports known occurrences and suitable habitat for several R8 Sensitive species, all of which were considered in this analysis. This BE documents the analysis of potential impacts of the proposed project to Sensitive species and associated habitat. It also serves as biological input into the environmental analysis for project-level decision-making to ensure compliance with the ESA, National Environmental Policy Act (NEPA), and National Forest Management Act (NFMA).

## Project Area and Effects Analysis Area

The proposed project is located along State Route (SR) 33 (Rawley Pike) on the east side of Shenandoah Mountain (see map provided by VDOT below). This 1.83-mile long project extends from 0.05-mile west of Switzer Lake Road to Laurel Wood Lane. This location is near the West Virginia border on the North River Ranger District in Rockingham County, VA. The geographic scope of this biological analysis for terrestrial plants and animals is the project area (project disturbance area). With regards to impacts to the aquatic ecosystem, the boundary of the analysis will be the confluence of Skidmore Fork with Dry River.




**Proposed Action(s)**

The Forest Service is proposing to issue a Public Road Easement under the Act of October 13, 1964, (P.L. 88-657), 36 CFR 251.50 to VDOT to widen portions of SR 33 onto various locations of National Forest System Lands. The proposed entire special use permit right of way easement is for 17.3 acres but only 5 acres will have ground disturbance and tree clearing associated with the widening. This widening would adjust roadway positioning and grade including installing paved shoulders and widening and flattening of several curves.

The proposed project would widen the existing roadway to provide 22 feet of paved travelway and 4 feet of paved shoulder on each side of the travelway. The existing edge of pavement at the drop-off

would be maintained and the widening would occur toward the embankment side of the road and would provide a minimum of a 6 feet front slope at a 4:1 (Width:Height ratio) for the ditches. This project would be designed in accordance with VA Stormwater regulations which would address all storm water concerns during and post construction. Additionally, VDOT would be required to follow all VA State Erosion and Sediment regulations.

**Need For The Proposed Action(s)**

The purpose of this project is to respond to an application submitted by the Virginia Department of Transportation (VDOT) to widen portions of SR 33 to improve vehicle safety. SR 33 is a two-lane roadway with shoulder width ranging from zero to two feet with several sharp dangers curves that crosses National Forest System lands on the North River Ranger District on the George Washington National Forest. In some of these locations there are no recovery or roadway shoulders for vehicles to pull off of the road. The existing roadway has a winding alignment typical to mountainous terrain. There are steep inclines where no truck climbing lanes exist causing dangerous interfaces between tractor trailer and car traffic where tractor trailer trucks comprise 5% of the traffic counts. The average daily traffic count is 2,054 vehicles per day with recurring traffic accidents.

VDOT has identified this as a priority safety project with funds allocated for the improvements. Additional project information can be found on the VDOT website - https://www.virginiadot.org/projects/staunton/rockingham_8211_route_33_improvements.asp .

The project location has been allocated per the 2014 George Washington Revised Land and Resource Management Plan (Forest Plan) to Management Prescription Areas: 7B (Scenic Corridor Viewshed) and 8E7 (Shenandoah Mountain Crest). These management prescriptions allow for road improvement activities that are necessary due to public health and safety. Specifically, 8E7 states on page 4-117 “Road reconstruction is needed to implement a road safety improvement project on a system road determined to be hazardous on the basis of accident experience or accident potential on that road”.

**Species Reviewed**

Southern Region sensitive species that may potentially be impacted by this project were examined using the following existing available information:

1. Reviewing the list of R8 Sensitive plant and animal species known or likely to occur on the George Washington National Forest, and their habitat preferences. This review included the current Southern Region Sensitive Species list for the Forest, dated March 15, 2018 with Forest-specific updates current as of May 30, 2020 (attached as OAR table).
2. Consulting element occurrence records (EORs) for Federally Threatened, Endangered, or Regional Foresters Sensitive (TES) species as maintained by the Virginia Division of Natural Heritage (VDNH), and supplied to the Forest.
3. Consulting species information, including county occurrence records, as maintained in the online database (http://vafwis.org/fwis/?Menu=Home.Visitor+Options) titled Virginia Fish and Wildlife Information Service (VAFWIS) of the Virginia Department of Wildlife Resources (DWR).

4. Consulting with individuals in the private and public sector who are knowledgeable about the area and its flora and fauna.
5. Reviewing sources listed in the reference portion of this report.
6. Reviewing the results of past field surveys that may have been conducted in the area.

Most Sensitive species known to occur on the Forest have unique habitat requirements, such as shale barrens, rock outcrops, bogs, caves, and natural ponds. Information gathered, analyzed, and presented in the Southern Appalachian Assessment dated July 1996 states that approximately 74% of sensitive species are associated with rare or unique habitats, often referred to as rare communities.

Through cooperative agreements between the Forest and VDNH and WVNHP, Special Biological Areas have been identified and delineated on the Forest. These include rare and significant natural communities and vegetative types. These areas reflect current knowledge of the location, management, and protection needs of rare species and associated significant natural communities on the Forest. These areas are identified in the George Washington Forest Plan as Management Prescriptions 4B-Research Natural Areas, 4C1-Geologic Areas, 4D-Botanical -Zoological Areas (Special Biological Areas) and in a supplemental report from VDNH, dated July 2000, which identifies additional areas for consideration as Special Biological Areas. Based on proposed project location, these Special Biological Area reports were reviewed as part of this analysis. As a result of this review, it was determined that the Northern boundary of the project area is adjacent to the Cow Knob Salamander SBA.

Appendix A of this document lists all 199 TES species currently known, or expected to occur, on or near the George Washington and Jefferson National Forests. All species on the list were considered during the analysis for this project. This document will focus only on the Regional Foresters Sensitive Species. VDOT consulted with, and received concurrence via Self-Certification Letter from the US Fish & Wildlife Service regarding Federally listed species and Eagles on March 9, 2018.

A “step down” process was followed to eliminate species from further analysis and focus on those species that may be affected by proposed project activities. Species not eliminated are then analyzed in greater detail. Results of this step-down analysis process are displayed in the Occurrence Analysis Results (OAR) column of the table in Appendix A. First, the range of a species was considered. Species’ ranges on the Forest are based on county records contained in such documents as the “Atlas of the Virginia Flora,” but are further refined when additional information is available, such as more recent occurrences documented in scientific literature or in Natural Heritage databases. Many times, range information clearly indicates a species will not occur in the project area due to the restricted geographic distribution of most TES species. When the project area is outside a known species range, that species is eliminated from further consideration by being coded as OAR code "1" in the Appendix A table. For this project, 103 species were eliminated from further consideration because the project area is not within the species’ known range. For the remaining species, after this first step, results from past surveys and knowledge of the areas and potential for suitable habitat were considered.

**Field Surveys and Results**

Some species could not be eliminated from further consideration based on known range. The project area was surveyed by Fred Huber-Forest Botanist (now retired) and Mike Donahue-Biological Technician, on August 31, 2017. The survey method consisted of walking through the project area searching for different habitat types and TESLR species occurrences. The plant, animal and habitat survey consisted of searching for individuals, signs of their presence and/or potential habitat. Ecological models were also used to aid in cow knob salamander habitat association (Jacobsen, 2019).

The site was dry ridgetop mixed deciduous hardwoods (chestnut oak, table mtn pine) with midstory (mt laurel, bear oak); no TES plant, animal, or rare community was found. See pictures below as examples of habitat in project area (Photo Credit: Mike Donahue).

From the field surveys and knowledge of the area, species were eliminated from further consideration because of:

a) a lack of suitable habitat in the project areas (OAR code "2");

b) habitat present and the species has been searched for, but has not been found (OAR code "3");

c) species occurs in the project areas, but out of the actual area of activity (OAR code "4");

d) aquatic species of habitat known or suspected downstream of project or activity areas but outside the identified geographic bounds of water resource cumulative effects analysis area (defined as the point below which sediment amounts are immeasurable and insignificant) (OAR code "7");

e) Historic records for this species only; or no known records on GWJ; or species considered extirpated from Virginia/West Virginia (OAR code 10);

f) Habitat present within project area, species known or suspected to occur in activity area. However, project design and mitigation measures result in no effect or no impact for this species, since activities will occur when species is either dormant or not in the project area due to time of year activities will occur, and/or activities will not impact habitat components species are known to utilize for their life cycle needs (OAR code 11).

The results of the field surveys are documented in Appendix A. For this project, 40 species were eliminated from further consideration because of one of the above reasons.

**Species Identified as Being in the Action Area or Potentially Affected by the Action**

From past field surveys and knowledge of the area, and given the proposed action, those species which are analyzed and discussed further in this document are those that: a) are found to be located in the activity areas (OAR code "5"); b) were not seen during the survey(s), but possibly occur in the activity areas based on habitat observed during the survey(s) or field survey was not conducted when species is recognizable (OAR code "6"); c) for aquatic species, they are known or suspected downstream of project or activity areas and within identified geographic bounds of water resource cumulative effects analysis area (OAR code "8") and d) federally listed mussel and/or fish species known in 6th level watershed of project areas. Conservation measures from USFWS/FS Conservation Plan applied (OAR code "9").

As a result of this process, the following 4 species are known or suspected to occur in or near the area or are potentially impacted by the proposed action and are coded OAR Code 6.

| OAR Code | Scientific Name | Common Name | Taxa | TES |
|---|---|---|---|---|
| **6** | *Plethodon punctatus* | Cow Knob Salamander | Amphibian | S |
| **6** | *Plethodon virginia* | Shenandoah Mountain Salamander | Amphibian | S |
| **6** | *Perimyotis subflavus* | Tricolored bat | Mammal | S |
| **6** | *Danaus plexippus* | Monarch | Butterfly | S |

Other than the 4 species above, no other Sensitive species or associated potential habitat was identified during field surveys or considered to exist within the project area or the aquatic cumulative effects boundary.

**Effects of Proposed Management Action on Each Identified Species**

The analysis of possible effects to species identified as known or expected to occur in the vicinity of the proposed project, or likely to be impacted by the action includes the following existing information:

- Data on species/habitat relationships
- Species range distribution
- Occurrences developed from past field surveys or field observations
- The amount, condition, and distribution of suitable habitat

**Effects to Sensitive Species**

Direct, Indirect, and Cumulative Effects to Salamander Species

Cow Knob salamanders (*Plethodon punctatus*) inhabit old growth, mixed forests at high elevations and an abundance of surface rocks. Potentially suitable habitat for Cow Knob salamander is also potentially suitable for Shenandoah Mountain salamander (*Plethodon virginia*). The range of Shenandoah Mountain salamander is approximately 1,000 square miles and nearly the same as that of the Cow Knob salamander, though it is not restricted to mesic, higher elevation, sites (Highton, 1999; AmphiaWeb, 2019). These salamanders prefer mature hardwood forested stands, though they are more habitat generalists, and will inhabit other forest types as well (Beane et.al., 2010 & pers. com Flint, 2019). Fraser (1976) described Shenandoah Mountain salamander habitat at a site in Rockingham County, Virginia

with ridges characterized by deep soil with a predominant vegetation of white oak and late low blueberry, and slopes characterized by shallow, rocky soil with a predominant vegetation of chestnut oak, red maple, late low blueberry, witch hazel and mountain laurel. During 2017 project surveys for CKS, Flint noted that Shenandoah Mountain salamanders are "more a habitat generalist than Cow Knob salamander" with occurrences on various aspects, habitat types and from elevations of approximately 2000' to 2800'. He also noted there was a trend of detecting Shenandoah Mountain salamanders in more xeric (dry) forest types than Cow Knob salamanders and other Plethodon species prefer (pers. com. Flint, 2019).

Approximately 5 acres of ground disturbance associated with this project intersects the Shenandoah Mountain Crest Management Prescription and Cow Knob Salamander SBA; this is less than 0.008 percent of the 58,000 acres of suitable habitat available on the Forest for the Cow Knob Salamander. Furthermore, about half of that proposed area is characterized as low habitat suitability, and half characterized as moderate habitat suitability by Jacobsen' model (2019). Field surveys indicated the area as being dry, south-facing roadsides with shallow soils, surface bedrock, and limited talus. Although within the range of both these salamanders, because of the condition of the habitat adjacent to the existing state road, it is unlikely that either are found within the area and the risk of inadvertently harming individuals is very low. Therefore, there are no known impacts that should result from implementation of this project that would adversely impact species viability or result in a trend toward federal listing of either of these species under the Endangered Species Act. Project activities meet the Forest Plan (see Forest Plan page 4-117) and the Conservation Agreement (1994) between the USFS and the USFWS regarding Cow Knob salamanders. The Conservation Agreement specifically states that existing roads can be maintained, and reconstruction and minor relocation is permitted, provided these activities do not impact salamander populations. There are no additional foreseeable activities in the area that would directly or indirectly affect the Cow Knob or Shenandoah Mountain salamanders. Therefore, there will be no cumulative effects to these species from the proposed project.

Direct, Indirect, and Cumulative Effects to the Tricolored bat (*Perimyotis subflaus*)

Effects to tricolored bats were considered in this BE because this area is likely to support occurrences of the tricolored bat and habitat features found in the project area could be utilized by this species. Tricolored bats have a widespread range across the eastern United States and southeastern Canada, south into Central America, extending west into the central Great Plains. This bat occurred commonly across Virginia and West Virginia in summer and during migration (NatureServe 2018). Once one of our most common bat species, tricolored bats have experienced substantial declines across Virginia and West Virginia, since the discovery of white-nosed syndrome (WNS) in 2009. In Virginia, winter hibernacula monitoring surveys have documented are more than 95% decline across the State. It is now State listed as Endangered (VDGIF 2016).

This species is a small bat, reaching 3½ inches in length and has a wingspan of just over 9 inches. The fur color is variable, but typically is a reddish brown to yellowish brown, slightly lighter on the belly. Its back fur is unique being tricolored -- gray at the base, tan in the middle, and dark-tipped. The wing membranes are blackish, but the skin covering the larger wing bones, including the forearm, is flesh colored.

Tricolored bats will hibernate in a variety of sites including mines, rock shelters, and quarries, but they use caves most frequently. They are typically found hanging singly from the ceiling or along a wall. The bats prefer relatively warmer and more humid portions of caves for hibernation. They often have water

droplets condensed on their fur that can make them sometimes appear white when a light is shined on them. Although most summer roosting sites are unknown in Virginia or West Virginia, this species has been observed roosting in high tree foliage, often in clumps of dead leaves or needles, in tree crevices and cavities, and human constructed structures such as buildings, homes, barns, sheds and bridges (VDGIF 2016, NatureServe 2018). There are currently no known maternity colony or roosting sites in Virginia (VDGIF 2016). At maternity colonies, one to two pups are born to each female during June. Males likely roost in trees and/or manmade structures during summer. Tricolored bats feed almost entirely on small flying insects they capture mostly along woodland edges, as well as along waterways and riparian area, near forested habitat (NatureServe 2018). Suitable habitat for tricolored bat is known to occur on all GW/Jeff districts and counties.

The proposed project area is outside of known high priority hibernacula and roost sites for tricolored bats in Virginia (VDGIF 2016). There were no tricolored bats seen during field visits. Information furnished by Rick Reynolds and displayed on the Little brown and tri-colored bat Winter Habitat & Roost Tree Application map maintained by VDGIF indicates the closest known hibernacula is approximately 19 miles to the southwest of the project area. According to VDOT documents, they will be adhering to a time of year restriction of April 15 through September 15 of any given year for removing trees greater than or equal to 3 inches diameter at breast height and removing trees during the inactive season, or limit tree removal to 10 or fewer trees per project at any time of year within 100 feet of existing road surface. The risk of inadvertently harming individuals is very low. With these restrictions in place, there are no known impacts that should result from implementation of this project. In addition, this project-level analysis follows direction in the George Washington National Forest's Revised Forest and Land Resource Management Plan (Forest Plan) and Final Environmental Impact Statement (FEIS). There are no additional foreseeable activities in the area that would directly or indirectly affect the tricolored bat. Therefore, there will be no cumulative effects to the tricolored bat from the proposed project.

Direct, Indirect, and Cumulative Effects to the Monarch (*Danaus plexippus*)

The monarch butterfly is a well-known and widespread species belonging to the family *Nymphalidae*, known from South America across to North America, including the continental US. It is associated with open lands, including wildlife openings, native prairie patches, roadsides, open woodlands, early successional woody habitat, utility corridors and grassland/shrublands where host and nectar plants are found. Monarchs can be found foraging in suitable habitat, during the breeding season and fall migration, throughout the George Washington and Jefferson National Forest. The butterfly is relatively large with a wingspan of 3.75 to 4.875 inches. Wings are orange to orange-brown with wide black borders and black veins. Males have a patch of scent scales on each hind wing that appear as a black spot (BMNA 2017).

North America forms the core of the monarch's range, and North American populations are strongly migratory, resulting in different seasonal ranges. Essential overwintering areas for these populations are limited to a few dozen places in coastal California and the mountains of Mexico. The summer range includes portions of the continental U.S and the southern portions of Canada bordering the US, where milkweeds (*Asclepias spp.*) occur.

The Monarch caterpillar feeds on a variety of milkweed species, the most important of which are common milkweed (*Asclepias syriaca*), swamp milkweed (*A. incarnata*), and green antelopehorn (*A. viridis*). The first two are used primarily in summer/fall and the last is used in spring and sometimes summer/fall. Eggs are laid singly on the underside of host plant leaves. Caterpillars, with circular strips of white/yellow and black feed on both leaves and flowers. The chrysalis is a bright light green with black and gold ornamentation.

In general, breeding areas are virtually all patches of milkweed in North America and some other regions. Any patch of milkweed is likely to be used at least some seasons in much of the range. A critical conservation feature for North American populations is the overwintering habitats, which are certain high-altitude Mexican conifer forests or coastal California conifer or Eucalyptus groves as identified in literature. It appears most North American monarchs overwinter in one of these two areas. In the fall, adults migrate from the eastern and central US migrate to central Mexico (population 2, NatureServe 2018). All adults are dependent on a variety of nectar sources along migration routes. Population 2 is in drastic decline compared with numbers recorded 10-20 years ago (NatureServe 2018). Cumulative factors such as illegal logging, erratic and extreme weather in the narrowly distributed wintering range, and loss of milkweed and nectars plants in the mid-western United States have led to declines (Pleasants 2015, Ramírez et al. 2015, NatureServe 2018). Widespread use of neonicotinoid pesticides may also contribute to declines (Krischik et al. 2015, Percenka and Lundgren 2015). Population 2 has global rank of G4T1, indicating that while widespread, the population is critically imperiled.

During implementation of the project, existing milkweed and other nectaring plants may be impacted along the current affected roadside corridor, possibly impacting individual monarchs, especially eggs and caterpillars, if present on milkweed plants. Once completed, the management roadside corridors will help provide additional suitable habitat for monarch butterflies throughout the project area. Including a variety of milkweed and flowering nectar plants in seeding mixes will further increase the value of these Monarch habitats; therefore there should be no net negative effect, nor a trend toward federal listing for the Monarch. Project implementation is expected to have longterm beneficial impacts to Monarch butterflies. There are no additional foreseeable activities in the area that would directly or indirectly affect the monarch. Therefore, there will be no cumulative negative effects to the Monarch butterfly from the proposed project.

**Summary of Determination of Effects to Sensitive Species**

The summary of effects are:

- **Cow Knob Salamander** – The project is within the range for this species but because of the condition of habitat and the small amount of disturbed area, it was determined there are no known impacts that should result from implementation of this project that would adversely impact species viability. The proposed action "*may impact individuals but not likely to cause a trend to federal listing or a loss of viability*" and will not contribute to a trend toward federal listing of this species under the Endangered Species Act.

- **Shenandoah Mountain Salamander** – The project is within the range for this species but because of the condition of habitat and the small amount of disturbed area, it was determined there are no known impacts that should result from implementation of this project that would adversely impact species viability. The proposed action "*may impact individuals but not likely to cause a trend to federal listing or a loss of viability*" and will not contribute to a trend toward federal listing of this species under the Endangered Species Act.

- **Tricolored bat** – This species has the potential to be present, but with project time of year and tree cutting restrictions in place, there are no known impacts that should result from implementation of this project. The proposed action will have "*no impact"* on this species

and will not contribute to a trend toward federal listing of this species under the Endangered Species Act.

- **Monarch–** This species has the potential to be present during summer months, but it was determined there are no longterm negative impacts that should result from implementation of this project that would adversely impact species viability, and the scope of the activities will not contribute to a trend toward federal listing of this species under the Endangered Species Act. Project implementation will improve habitat for Monarch butterflies within the project area and will thus have "*beneficial impacts"* to this species and its preferred habitat.

The project will have no impact on any other Southern Region Sensitive species.

**Persons Consulted:**

Mike Donahue, USFS Biological Technician

Fred Huber, USFS Forest Botanist (retired)

Carol Croy, USFS Forest Wildlife Biologist

Meg Riddle, USFS North Zone District Biologist

## Prepared by:

/s/ Dawn M. Kirk Date: July 6, 2021

Forest Fisheries Biologist

# References

AmphibiaWeb. 2019. University of California, Berkeley, CA, USA. Accessed 12 Jul 2019. http://amphibiaweb.org

Bean, J.C., Braswell, A.L., Mitchell, J.C., Palmer, W.M., and Harrsion, J.R. 2010. Amphibians and Reptiles of the Carolinas and Virginia, 2nd ed., rev. and updated. The University of North Carolina Press, Chapel Hill, NC. 274 p

Burkhead, N. M., and R. E. Jenkins. 1991. Fishes. Pages 321-409 in K. Terwilliger (coordinator). Virginia's Endangered Species: Proceedings of a Symposium. McDonald and Woodward Publishing Company, Blacksburg, Virginia.

Croy, Steven Q. 2013. Forest Ecologist & Fire Planner, George Washington and Jefferson National Forests in Virginia, Roanoke Virginia. Records of Prescribed Burning on the George Washington and Jefferson National Forests in Virginia.

Dibble A.C., W. A. Wright and C. S. Campbell. 1997. Small Whorled Pogonia (Isotria medeoloides): Demographic Monitoring and Habitat Manipulation Experiment. Unpubl. Report prepared for the Maine Natural Areas Program, Maine Dept. of Conservation. 8pp.

Erdle, S. Y. and C. Hobson. 2001. Current Status and Conservation Strategy for the Eastern Small-footed Myotis (*Myotis leibii*). Technical Report 00-19. VDCR-DNH. October 2001. 17 pp plus appendices.

Flint, W. 2019. Personal communication.

Fraser, D.F. 1976. Coexistence of salamanders is the genus Plethodon: a variation of the Santa Rosalia theme. Ecology, 57: 238-251.

Hamed, M. K., and F. J. Alsop, III. 2005. Distribution of the Tennessee dace, Phoxinus tennesseensis, in northeast Tennessee. Journal of the Tennessee Academy of Science 80(1):1-5.

Harris D. U. S. Fish and Wildlife Service. Sept. 1998. Personal communication. NatureServe Explorer: An online encyclopedia of life [web application]. 2001. Version 1.6. Arlington, Virginia, USA: NatureServe. Available:

Harvill, A. M., Jr., et al. 1992. Atlas of the Virginia Flora. Third Edition. Burkeville, Virginia: Virginia Botanical Associated.

Hicks, M.L. 1992. Guide to the Liverworts of North Carolina. Duke University Press. Durham, NC 239 pps.

Highton, R. 1999. Geographic Protein Variation and Speciation in the Salamanders of the Plethodon cinereus Group with the Description of Two New Species. Herpetologica, 55(1), 43-90. Retrieved from www.jstor.org/stable/3893067

Jacobsen, Carl David. 2019. "Influence of climate change and prescribed fire on habitat suitability and abundance of the high-elevation endemic Cow Knob Salamander (Plethodon

punctatus)" (2019). Graduate Theses, Dissertations, and Problem Reports. 4051. https://researchrepository.wvu.edu/etd/4051

Jenkins, R. E. and N. Burkhead. 1994. Freshwater Fishes of Virginia. American Fisheries Society.

Kain, Teta, editor. 1987. Virginia's Birdlife - An Annotated Checklist. Virginia Avifauna Number 3. The Virginia Society of Ornithology.

Linzey, D. W., ed. 1979. Proceedings of the Symposium on Endangered and Threatened Plants and Animals of Virginia. Blacksburg: Center for Environmental Studies, Virginia Polytechnic Institute and State University.

Linzey, D. W. 1998. Mammals of Virginia. The McDonald and Woodward Publishing Company. Blacksburg, VA.

NatureServe. 2018 NatureServe Explorer: An online encyclopedia of life [web application]. Version7.1. Arlington, Virginia, USA: NatureServe. Available: http://www.natureserve.org/explorer/index.htm

Parmalee, P.W. and A.E. Bogan. 1998. The Freshwater Mussels of Tennessee. The University of Tennessee Press, Knoxville.

Pleasants, J.M. 2015. Monarch butterflies and agriculture. Pp. 169-179. IN: Oberhauser, K.S., E.R. Nail, S. Altizer, eds. 2015. Monarchs in a changing world. Cornell University Press. Ithica, NY and London, England. 321 p.

Radford, A.E., Ahles, H.E., Bell, C.R. 1968. Manual of the Vascular Flora of the Carolinas. The University of North Carolina Press, Chapel Hill, North Carolina.

Ramírez, M.I., C. Sáenz-Romero, G. Rehfeldt, and L. Salas-Canela. 2015. Threats to the availability of overwintering habitat in the Monarch Butterfly Biosphere Reserve. Pp. 107-168. IN: Oberhauser, K.S., E.R. Nail, S. Altizer, eds. 2015. Monarchs in a changing world. Cornell University Press. Ithica, NY and London, England. 321 p

Roble, S. M. 2010. Natural Heritage Resources of Virginia: Rare Animal Species. Natural Heritage Technical Report 10-12. VDCR-DNH, Richmond, VA. 45 pp + appendices.

Southern Appalachian Man and the Biosphere (SAMAB). 1996. The Southern Appalachian Assessment Terrestrial Technical Report. Report 5 of 5. Atlanta: U. S. Department of Agriculture, Forest Service, Southern Region.

Starnes, W. C., and R. E. Jenkins. 1988. A new cyprinid fish of the genus PHOXINUS (Pisces: Cypriniformes) from the Tennessee River drainage with comments on relationships and biogeography. Proceedings of the Biological Society of Washington 101:517-29.

Strausbaugh, P. D., and E. L. Core. 1978. Flora of West Virginia. Second edition. Grantsville, West Virginia: Seneca Books.

Terwilliger, Karen (coordinator). 1991. Virginia's Endangered Species: Proceedings of a Symposium. Department of Game and Inland Fisheries. McDonald and Woodward Publishing Company. Blacksburg, Virginia. 672 pp.

Townsend, John F. 2012. Natural Heritage Resources of Virginia: Rare Plants. Natural Heritage Technical Report 12-12. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. Unpublished report. December 2012. 55 pp + appendices.

U. S. Fish and Wildlife Service. 1992. Small Whorled Pogonia (Isotria medeoloides) Recovery Plan, First Revision. Newton Corner, Massachusetts. 75pp.

U.S.D.A. Forest Service and U.S. Fish & Wildlife Service. 1994. Conservation Agreement for the Cow Knob Salamander.

U.S.D.A. Forest Service. 2014. Forest Ecology Group (Biology), Jefferson National Forest. Roanoke, Virginia.

U.S.D.A. Forest Service. 2004. Final Revised Land and Resource Management Plan, Jefferson National Forest. Roanoke, Virginia.

U.S.D.A. NRCS. 2013. The PLANTS Database, Version 3.5. Internet Resource *USDA Plants Database*. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

VanAlstine, N.E., W.H. Moorhead III, A. Belden, Jr., T.J. Rawinski, and J.C. Ludwig. 1996. Recently discovered populations of small whorled pogonia (*Isotria medeloides*) in Virginia. Banisteria 7:3-7.

Virginia Department of Game and Inland Fisheries. 2016. The Virginia Fish and Wildlife Information Service. Website: http://vafwis.org/fwis/?Menu=Home.Visitor+Options

Weakley, A.S. November 2012. Flora of the Southern and Mid-Atlantic States – Working Draft. University of North Carolina, Chapel Hill, NC. 1225 pgs.

Wilson, I.T. 2000. Special Biological Areas on the Jefferson National Forest, First Supplement. Natural Heritage Technical Report 00-11. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, VA. Unpublished report submitted to the USDA Forest Service. 114 pp plus maps.

**Documentation of Threatened, Endangered or Sensitive Species Occurrences for**

**(VDOT - Route 33 Rawley Pike Road Improvement)**

**Coding for Occurrence Analysis Results (OAR) for 199* Species**

***199 includes TES, however, this document addresses Sensitive species only, see FWS concurrence for T&E**

**Forest updated May 30, 2020 (based on Region 8 Sensitive species list effective March 15, 2018)**

| OAR | GW | J | Species Name | Common Name | Range on or near GWJNFs | Habitat - Detail | TES | GRank | VA SRank | WV SRank |
|---|---|---|---|---|---|---|---|---|---|---|
| **VERTEBRATE** | | | | | | | | | | |
| **Fish** | | | | | | | | | | |
| 1 | - | X | *Ammocrypta clara* | Western sand darter | Clinch R, Powell R | Aquatic-rivers. | S | G3 | S1 | - |
| | - | X | *Chrosomus cumberlandensis* | Blackside dace | Upper Cumberland R, Upper Powell R, Poor Fk Cumberland R, Clinch R drainage - Staunton Ck McGhee Ck | Aquatic-streams. | T | G2 | S1 | S3 (KY) |
| | - | X | *Erimonax monachus* | Spotfin chub | Lower N Fk Holston R | Aquatic-streams. | T | G2 | S1 | - |
| | - | X | *Erimystax cahni* | Slender chub | Two sites - Powell R, Lee Co | Aquatic-rivers. | T | G1 | S1 | - |
| 1 | - | X | *Erimystax insignis* | Blotched chub | Clinch-Powell system, S Fk Holston R | Aquatic-streams/rivers. | S | G4 | S3 | - |
| 1 | - | X | *Etheostoma acuticeps* | Sharphead darter | S and Middle Fk Holston R | Aquatic-rivers. | S | G3 | S1 | - |
| 1 | - | X | *Etheostoma cinereum* | Ashy Darter | Upper Clinch R, Guest R gorge | Aquatic-rivers. | S | G2G3 | S1 | - |
| | - | X | *Etheostoma osburni* | Candy darter | Big Stony Ck, Dismal Creek, Cripple Creek (New R watershed) | Aquatic-streams. | E | G3 | S1 | S1 |
| | - | X | *Etheostoma percnurum* | Duskytail darter | Copper Ck, Clinch R | Aquatic-rivers. | E | G1 | S1 | - |
| 1 | - | X | *Etheostoma denoncourti* | Golden darter | Four sites Clinch R, lower Copper Ck. | Aquatic-rivers. Formerly: Tippecanoe darter, *Etheostoma tippecanoe.* | S | G3G4 | S1 | S2 |
| 1 | - | X | *Etheostoma vulneratum* | Wounded darter | N & S Fk Holston R, Clinch R, Powell R. | Aquatic-Rivers. | S | G3 | S2S3 | - |
| 1 | - | X | *Icthyomyzon greeleyi* | Mountain brook lamprey | M, N Fk Holston R, Copper Ck, Indian Ck, Clinch R, Powell R | Aquatic-rivers. | S | G3G4 | S2 | S1 |
| 1 | - | X | *Notropis ariommus* | Popeye shiner | N Fk Holston R, Clinch R, Powell R | Aquatic-rivers. | S | G3 | S2S3 | S2 |
| 1 | X | X | *Notropis semperasper* | Roughhead shiner | Upper James R watershed above Buchanan (Cowpasture R, Jackson R, Craig Ck) | Aquatic-rivers. | S | G2G3 | S2S3 | - |
| | - | X | *Noturus flavipinnis* | Yellowfin madtom | Lower & Mid reaches of Copper Ck, Powell R | Aquatic-streams. | T | G1 | S1 | - |
| 1 | X | X | *Noturus gilberti* | Orangefin madtom | S Fk Roanoke R watershed, Roanoke R above Salem, Craig Ck, Johns Ck, Cowpasture R | Aquatic-streams. | S | G2 | S2 | - |
| 1 | - | X | *Percina burtoni* | Blotchside logperch | N Fk Holston R, Clinch R, Copper Ck, Little R | Aquatic-rivers. | S | G2G3 | S1 | - |
| | - | X | Percina rex | Roanoke logperch | Upper Roanoke R watershed | Aquatic-rivers. | E | G1G2 | S1S2 | - |

| OAR | GW | J | Species Name | Common Name | Range on or near GWJNFs | Habitat - Detail | TES | GRank | VA SRank | WV SRank |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | - | X | *Percina williamsi* | Sickle darter | S & N Fk Holston R above Saltville, Clinch R - lower Copper Ck. | Aquatic-rivers. Formerly: *Percina macrocephala*. | S | G2 | S1S2 | S2 |
| 1 | - | X | *Phenacobius teretulus* | Kanawha minnow | Upper New R watershed | Aquatic-streams. | S | G3G4 | S2S3 | S1 |
| **Amphibian** | | | | | | | | | | |
| 1 | - | X | *Aneides aeneus* | Green salamander | Bland, Dickenson (Skegg Boulderfield), Lee, Russell, Scott, Tazewell, Washington, Wise, Wythe Cos VA; Greenbrier, Monroe, Pendleton Cos WV | Damp (not wet) crevices in shaded rock outcrops and ledges; beneath loose bark; in cracks of standing or fallen trees; in or under logs on ground. | S | G3G4 | S3 | S3 |
| 1 | - | X | *Cryptobranchus alleganiensis* | Hellbender | N & S Fk Holston (Whitetop Laurel), Clinch R, Copper Ck, Powell R. | Aquatic-rivers, streams. | S | G3G4 | S2S3 | S2 |
| 1 | - | X | *Desmognathus organi* | Northern pygmy salamander | Grayson, Smyth, Washington Cos. Whitetop Mt. and Mt. Rogers | Spruce-fir forests and adjacent northern hardwoods, >3600' | S | G3 | S2 | - |
| 1 | - | X | *Plethodon hubrichti* | Peaks of Otter salamander | Peaks of Otter, Apple Orchard Mtn | Mixed oak, late successional with loose rocks and logs, >1800'. | S | G2 | S2 | - |
| 6 | X | - | *Plethodon punctatus* | Cow Knob salamander | Shenandoah Mtn, VA & WV | Mixed oak, late successional with loose rocks and logs, >2500'. | S | G3 | S2 | S1 |
| 1 | X | - | *Plethodon sherando* | Big Levels salamander | Big Levels, Augusta Co | Forest and rocky talas slopes 1900' – 3580'. | S | G2 | S2 | - |
| 6 | X | - | *Plethodon virginia* | Shenandoah Mountain salamander | Rockingham Co | Temperate forests between 3600' – 3900'. | S | G2G3 | S2 | SNR |
| 1 | - | X | *Plethodon welleri* | Weller's salamander | Mt Rogers & Whitetop Mtn | Spruce-fir forests and adjacent northern hardwoods. | S | G3 | S2 | - |
| **Reptile** | | | | | | | | | | |
| 1 | X | - | *Clemmys guttata* | Spotted turtle | Maple Flats, Augusta Co VA; Wardensville area, Hardy Co., WV | Mostly unpolluted, shallow bodies of water with a soft bottom and aquatic vegetation; small marshes, marshy pastures, bogs, fens, woodland streams, swamps, small ponds, vernal pools, and lake margins. | S | G5 | S4 | S1 |
| 2 | X | - | *Glyptemys insculpta* | Wood turtle | Page, Rockingham, Shenandoah Cos; N Shenandoah R watershed | Along permanent streams during much of year; in summer may roam widely overland; variety of terrestrial habitats adjacent to streams, including deciduous woods, cultivated fields, and woodland bogs, marshy fields and pastures. Overwinters in streams. | S | G3 | S2 | S3 |
| 10 | X | X | *Pituophis melanoleucus* | Pinesnake | Historic records from Alleghany, Augusta, Botetourt, Craig, Rockingham Cos., VA: Monroe Co, WV. No current records known from GWJNF. | Xeric, pine-dominated or pine-oak woodland with open, low understory established on sandy soils; require forest openings, with level, well-drained sandy soils and little shrub cover as nesting/hibernation sites. | S | G4 | S1? | SH |
| **Bird** | | | | | | | | | | |
| 1 | - | X | *Centronyx henslowii* | Henslow's Sparrow | Pulaski Co (Radford Arsenal). No nest records known on GWJNF. | Open fields, meadows with grass interspersed with weeds or shrubby vegetation, especially in damp or low-lying areas; un-mowed hayfields. Formerly: *Ammodramus henslowii*. | S | G4 | S1B | S1B |
| **Mammal** | | | | | | | | | | |
| 10 | - | - | *Corynorhinus rafinesquii* | Rafinesque's big-eared bat | Has not been found in VA but has occurred nearby in WV, KY, & TN. In 1978, a large nursery colony was found in Hancock Co., TN, very close to the VA-TN border. Only possible in Lee, Scott, Washington Co. | Caves in winter, large hollow trees summer, may also use cliff-lines, buildings, and bridges in summer. Not on VADCR-NHP "Rare Animal" list. | S | G3G4 | - | S1 |

| OAR | GW | J | Species Name | Common Name | Range on or near GWJNFs | Habitat - Detail | TES | GRank | VA SRank | WV SRank |
|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | *Corynorhinus townsendii virginianus* | Virginia big-eared bat | Summer: VA - Tazewell Co (3 caves), Highland Co (1 cave); WV - Pendleton Co (4 caves); Winter: Highland, Rockingham, Bland, and Tazewell Cos (6 caves); Pendleton Co (6 caves). Largest VA population in Tazewell Co and largest WV population in Pendleton Co. Small numbers of bats (usually <10) in a few other widely scattered caves during summer months. Bath & Pulaski Co records are historic. No occupied caves currently known on Forest. | Resides in caves winter and summer. Short distance migrant (<40 miles) between winter and summer caves. Forages primarily on moths and foraging habitat is common (fields, forests, meadows, etc.). Forages within 6 miles of summer caves. USFWS Critical Habitat is 5 caves in WV (4 Pendleton Co and 1 Tucker Co). Closest Critical Habitat cave to GWJNF is ~3 miles in Pendleton Co, WV. OAR code of "2" used when project further than 6 miles from summer or winter occupied cave. | E | G3G4T2 | S1 | S2 |
| | - | X | *Glaucomys sabrinus coloratus* | Carolina northern flying squirrel | Mt Rogers & Whitetop area | Spruce-fir forests and adjacent northern hardwoods. | E | G5T2 | S1 | - |
| 1 | X | - | *Glaucomys sabrinus fuscus* | Virginia northern flying squirrel | Laurel Fork area, Highland Co | Spruce forests and adjacent northern hardwoods. | S | G5T2 | S1 | S2 |
| | - | X | *Myotis grisescens* | Gray bat | Ridge & Valley, Clinch R watershed; Russell Fk at Russell Fk/Pound R confluence. | Caves winter and summer, forages widely. | E | G3 | S1 | - |
| 2 | X | X | *Myotis leibii* | Eastern small-footed bat | Blue Ridge, Ridge & Valley, Cumberland Mtns | Hibernates in caves during winter, roosts in crevices of large rock outcrops, cliffs, and under large rocks in talus & boulder-fields during summer, plus similar man-made structures like rip-rap and bridges, forages widely in all forested and open habitat types over both ridges and valleys. | S | G1G3 | S2 | S1 |
| | X | X | *Myotis septentrionalis* | Northern long-eared bat | Blue Ridge, Ridge & Valley, Cumberland Mtns | Hibernates in crevices and cracks of cave walls during winter (sometimes mines & tunnels), difficult to find and rarely seen. During summer, forages widely and roosts singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Also may roost in structures like barns, sheds, & houses. Decline due to WNS. | T | G1G2 | S1S3 | S1S2 |
| | X | X | *Myotis sodalis* | Indiana bat | Blue Ridge, Ridge & Valley, Cumberland Mtns | Caves winter, upland hardwoods summer, forages widely along riparian areas and open woodlands. | E | G2 | S1 | S1 |
| 6 | X | X | *Perimyotis subflavus* | Tricolored bat | Every county in VA, WV, KY | Caves in winter: Caves, trees, cliffs, barns during summer months. Decline due to WNS. Formerly: Eastern pipistrelle, *Pipistrellus subflavus*. | S | G2G3 | S1S3 | S2 |
| **INVERTEBRATE** | | | | | | | | | | |
| **Snail (Mollusk, Class Gastropoda)** | | | | | | | | | | |
| 1 | X | - | *Fontigens tartarea* | Organ cavesnail | Rock Camp Cave (1 mile from FS), McClung-Zenith Cave (1.5 mile from FS), Monroe Co, WV; Greenbrier, Pocahontas, Randolph, Tucker Cos, WV; Bath, Highland Cos, VA | Caves. Obligate troglobite. | S | G2 | S1S2 | S2 |
| 10 | - | - | *Gastrodonta fonticula* | Appalachia bellytooth | No known records on GWJ. Scott and Wise Co records need to be verified. | Damp, wooded environments, particularly in deep piles of wet leaf litter and around rotting wood debris. | S | G3G4 | S1S3 | S2 |
| 1 | X | X | *Glyphyalinia raderi* | Maryland glyph | Alleghany, Montgomery Cos | Calciphile, edge of seeps within leaf litter. May burrow. | S | G2 | S1S2 | SH |
| 1 | X | - | *Helicodiscus diadema* | Shaggy coil | Alleghany Co | Calciphile; semi-open, calcium-rich environments, especially limestone rubble/talus and thinly wooded limestone hills. | S | G1 | S1 | - |
| 1 | X | X | *Helicodiscus triodus* | Talus coil | Alleghany, Botetourt, Rockbridge Cos | Calciphile, limestone rubble on wooded hillsides and near cave entrances. | S | G2 | S1S2 | SH |

| OAR | GW | J | Species Name | Common Name | Range on or near GWJNFs | Habitat - Detail | TES | GRank | VA SRank | WV SRank |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | - | X | *Io fluvialis* | Spiny riversnail | Clinch R, N Fk Holston R | Aquatic-rivers. | S | G2 | S2 | - |
| 10 | - | - | *Paravitrea septadens* | Brown supercoil | Breaks Interstate Park, Dickenson Co; Buchanan Co., VA. No known records on GWJ. | Steep forested slopes and in ravines, often among woody debris, rocks, or deeper leaf litter; mixed eastern hemlock-hardwood forest, also in richer hardwood stands. | S | G1 | S1 | - |
| 10 | - | - | *Stenotrema altispira* | Highland slitmouth | No known records on GWJ. Grayson and Smyth Co records need to be verified. | Higher elevations, in leaf litter and woody debris. | S | G3 | S1 | - |
| 10 | - | - | *Ventridens decussatus* | Crossed dome | No known records on GWJ. Scott Co records need to be verified. | High elevations, usually >3000', in leaf litter, particularly oak leaves. | S | G3 | SU | - |
| 10 | - | - | *Vertigo bollesiana* | Delicate vertigo | No known records on GWJ. VA and WV records need to be verified. | Leaf litter often under shrubs, on cliff-face ledges and boulder tops in mesic upland forest, and damp microsites in northern white cedar wetlands. | S | G4 | SU | - |
| 1 | X | - | *Vertigo clappi* | Cupped vertigo | Greenbrier & Pendelton Cos, WV | Well-rotted, humid leaf litter and fine soil on shaded boulders, talus, ledges, and bases of forested lime-rich bedrock outcrops. | S | G1G2 | S1S2 | SH |
| **Mussel (Mollusk, Class Bivalvia)** | | | | | | | | | | |
| 1 | - | X | *Alasmidonta marginata* | Elktoe | Greenbrier R & New R, WV. Upper New R; Reed Creek; Sinking Creek (Giles Co.); Wolf Creek (Bland Co.); upper S Fk Holston; historical Upper Clinch. | Aquatic-rivers. | S | G4 | S1S2 | S2 |
| 1 | X | - | *Alasmidonta varicosa* | Brook floater | Potomac drainage | Aquatic-rivers. | S | G3 | S1 | S2 |
| 1 | - | X | *Alasmidonta viridis* | Slippershell mussel | Historic in Upper Clinch R excluding Copper Creek where extant; Upper S Fk Holston | Aquatic-rivers. | S | G4G5 | S1 | - |
| | - | X | *Cumberlandia monodonta* | Spectaclecase | 2 sites Clinch R | Aquatic-rivers. | E | G3 | S1 | - |
| | - | X | *Cyprogenia stegaria* | Fanshell | Lower Clinch R, Scott Co | Aquatic-rivers. | E | G1Q | S1 | S1 |
| | - | X | *Dromus dromas* | Dromedary pearlymussel | Clinch R, Powell R, N Fk Holston R | Aquatic-rivers. | E | G1 | S1 | - |
| | X | X | *Elliptio lanceolata* | Yellow lance | Roanoke R, James R | Aquatic-rivers. | T | G2G3 | S2S3 | - |
| | - | X | *Epioblasma brevidens* | Cumberlandian combshell | Clinch R, Powell R, N Fk Holston R | Aquatic-rivers. | E | G1 | S1 | - |
| | - | X | *Epioblasma capsaeformis* | Oyster mussel | Clinch R, Powell R, N Fk Holston R | Aquatic-rivers. | E | G1 | S1 | - |
| | - | X | *Epioblasma florentina aureola* | Golden riffleshell | Restricted to lower 1.0 mile of Indian Ck to Clinch R. All other historical populations in M & Upper Tennessee R system now extirpated. | Aquatic-rivers. Formerly: tan riffleshell. | E | G1T1 | S1 | - |
| | - | X | *Epioblasma torulosa gubernaculum* | Green-blossom pearlymussel | Clinch R, N Fk Holston R | Aquatic-rivers. | E | G2TX | SX | - |
| | - | X | *Epioblasma triquetra* | Snuffbox | Clinch R, Powell R, N Fk Holston R | Aquatic-rivers. | E | G3 | S1 | S2 |
| | - | X | *Fusconaia cor* | Shiny pigtoe | Clinch R, Powell R, N Fk Holston R, Copper Ck | Aquatic-rivers. | E | G1 | S1 | - |
| | - | X | *Fusconaia cuneolus* | Fine-rayed pigtoe | Clinch R, Powell R, Copper Ck, Little R | Aquatic-rivers. | E | G1 | S1 | - |
| | - | X | *Fusconaia masoni* | Atlantic pigtoe | Roanoke R, Craig Ck drainage | Aquatic-rivers. | PT | G2 | S2 | - |

| OAR | GW | J | Species Name | Common Name | Range on or near GWJNFs | Habitat - Detail | TES | GRank | VA SRank | WV SRank |
|---|---|---|---|---|---|---|---|---|---|---|
| | - | X | *Hemistena lata* | Cracking pearlymussel | Clinch R, Powell R | Aquatic-rivers. | E | G1 | S1 | - |
| | - | X | *Lampsilis abrupta* | Pink mucket | Clinch R | Aquatic-rivers. | E | G2 | SX | S1 |
| 1 | X | - | *Lampsilis cariosa* | Yellow lampmussel | N Fk Shenandoah R; Shenandoah, Warren Cos. | Aquatic-rivers. | S | G3G4 | S2 | S2 |
| 1 | - | X | *Lasmigona holstonia* | Tennessee heelsplitter | Upper Clinch, N and M Fk Holston R drainages; Wolf Ck, Bland Co below Burkes Garden | Aquatic-streams. | S | G3 | S1 | - |
| 7 | X | - | *Lasmigona subviridis* | Green floater | Widely distributed in N & S Fk Shenandoah R, Pedlar R, James R | Aquatic-rivers. | S | G3 | S2 | S2 |
| | - | X | *Lemiox rimosus* | Birdwing pearlymussel | Clinch R, Powell R, Copper Ck, Little R | Aquatic-rivers. | E | G1 | S1 | - |
| | X | X | *Parvaspina collina* | James spinymussel | Potts Ck, Craig Ck, Johns Ck, Patterson Run, Pedlar R, Cowpasture R, Mill Ck (Deerfield) | Aquatic-rivers. Formerly: *Pleurobema collina*. | E | G1 | S1 | S1 |
| | - | X | *Pegias fabula* | Little-winged pearlymussel | Clinch R, N Fk Holston R, S Fk Holston R, Little R | Aquatic-streams. | E | G1 | S1 | - |
| | - | X | *Plethobasus cyphyus* | Sheepnose | Clinch R, Powell R | Aquatic-rivers. | E | G3 | S1 | S2 |
| 1 | - | X | *Pleurobema cordatum* | Ohio pigtoe | Clinch R | Aquatic-rivers. | S | G4 | S1 | S2 |
| 1 | - | X | *Pleurobema oviforme* | Tennessee clubshell | Clinch R, Powell R, N, Middle, S Fk Holston R | Aquatic-streams. | S | G2G3 | S2S3 | - |
| | - | X | *Pleurobema plenum* | Rough pigtoe | Clinch R | Aquatic-rivers. | E | G1 | SH | SH |
| 1 | - | X | *Pleurobema rubrum* | Pyramid pigtoe | Upper Clinch R | Aquatic-rivers. | S | G2G3 | SH | - |
| 1 | - | X | ***Pleuronaia barnesiana*** | Tennessee pigtoe | Clinch R, Powell R, N Middle, S Fk Holston R | Aquatic-rivers. | S | G2G3 | S2 | - |
| | - | X | *Pleuronaia dolabelloides* | Slabside pearlymussel | Clinch R, M Fk Holston, N Fk Holston R | Aquatic-rivers. | E | G2 | S2 | - |
| | - | X | *Ptychobranchus subtentum* | Fluted kidneyshell | Holston R., Powell R., Indian R., Clinch R., Little R., Copper Ck., Big Moccasin Ck. Critical Habitat: Indian Ck, VA: M Fk Holston R. VA: Big Moccasin Ck., VA: Copper Ck., VA; Clinch R, TN, VA: Powell R., TN, VA | Aquatic-rivers. | E | G2 | S2 | - |
| | - | X | *Quadrula cylindrica strigillata* | Rough rabbits foot | Clinch R, Powell R, N Fk Holston R, Copper Ck | Aquatic-streams. | E | G3G4T2 | S2 | - |
| | - | X | *Quadrula intermedia* | Cumberland monkeyface | Powell R | Aquatic-rivers. | E | G1 | S1 | - |
| | - | X | *Quadrula sparsa* | Appalachian monkeyface | Clinch R, Powell R | Aquatic-rivers. | E | G1 | S1 | - |
| 1 | - | X | *Toxolasma lividum* | Purple lilliput | N Fk Holston R, Clinch R | Aquatic-rivers. | S | G3Q | SH | - |
| | - | X | *Villosa perpurpurea* | Purple bean | Clinch R, Copper Ck | Aquatic-rivers. | E | G1 | S1 | - |
| | - | X | *Villosa trabalis* | Cumberland bean | Clinch R | Aquatic-rivers. | E | G1 | SX | - |
| **Spider (Arachnid)** | | | | | | | | | | |
| | - | X | *Microhexura montivaga* | Spruce-fir moss spider | Whitetop Mtn | Damp, well-drained moss and liverwort mats on boulders in mature spruce-fir forests. | E | G2 | S1 | - |
| **Amphipod (Crustacean, Order Amphipoda)** | | | | | | | | | | |

| OAR | GW | J | Species Name | Common Name | Range on or near GWJNFs | Habitat - Detail | TES | GRank | VA SRank | WV SRank |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | - | X | *Stygobromus abditus* | James Cave amphipod | James, Sam Bells caves, Pulaski Co; Watsons cave, Wythe Co; and other New River caves. | Aquatic-caves, water well. | S | G3 | S3 | - |
| 1 | - | X | *Stygobromus emarginatus* | Greenbrier Cave amphipod | Greenbrier, Monroe Cos, WV | Aquatic-caves. In caves under gravel in streambeds, occasionally in pools. Most abundant in smallest trickles of water. Primarily in tiny first and second order headwater cave streams. | S | G3 | - | S3 |
| 2 | X | - | *Stygobromus gracilipes* | Shenandoah Valley cave amphipod | Frederick, Rockingham, Shenandoah, Warren Cos | Aquatic-caves. | S | G3G4 | S3 | S1 |
| 1 | X | - | *Stygobromus hoffmani* | Alleghany County cave amphipod | Low Moor cave (not on FS), Alleghany Co | Aquatic-caves, groundwater habitats including springs and seeps. | S | G2 | S2 | - |
| 1 | X | - | *Stygobromus mundus* | Bath County cave amphipod | Alleghany, Bath Cos | Aquatic-caves. | S | G2G3 | S1S2 | - |
| 1 | - | X | *Stygobromus pollostus* | Least Cave stygobromid | Greenbrier, Monroe Cos, WV | Aquatic-caves. | S | G2G3 | - | S1 |
| 1 | - | X | *Stygobromus spinatus* | Spiny Cave stygobromid | Southern Monroe Co, north-northeast to central Pocahontas, Co, WV, primarily within the Greenbrier Valley. Covers a linear distance of ~67 miles. | Aquatic-caves. In gravels of small streams and in small cave pools. | S | G2G3 | - | S2 |
| **Isopod (Crustacean, Order Isopoda)** | | | | | | | | | | |
| | X | - | *Antrolana lira* | Madison Cave Isopod | Documented population centers in Waynesboro-Grottoes area, Augusta Co; Harrisonburg area Rockingham Co; valley of main stem of Shenandoah R, Warren Cos, VA: Jefferson Co, WV. Not known from GWNF. | Aquatic-subterranean obligate in caves and karst groundwater. | T | G2G4 | S2 | S1 |
| 1 | - | X | *Caecidotea incurva* | Incurved cave isopod | McCullin Cave, Smyth Co; Groseclose Cave No. 1, Wythe Co | Aquatic-caves. | S | G2G4 | S2 | - |
| 1 | X | X | *Miktoniscus racovitzai* | Racovitza's terrestrial cave isopod | Alleghany, Botetourt, Page, Rockbridge, Shenandoah Cos | Aquatic-caves. | S | G3G4 | S2 | - |
| **Crayfish (Crustacean, Order Decapoda)** | | | | | | | | | | |
| | - | X | *Cambarus callainus* | Big Sandy crayfish | In VA, Upper Russell Fk drainage Big Sandy R | Aquatic-streams. Fast flowing streams of moderate width. Formerly: *Cambarus veteranus*. | T | G2 | S1S2 | S1 |
| **Centipede (Insect, Order Chilopoda)** | | | | | | | | | | |
| 1 | X | X | *Escaryus cryptorobius* | Montane centipede | The Priest, Nelson Co; Whitetop Mtn, near junction of Grayson, Washington, Smyth Co | Upper soil horizon, spruce-birch forests. | S | G2 | S2 | - |
| 1 | - | X | *Escaryus orestes* | Whitetop Mountain centipede | Whitetop Mtn, near junction of Grayson, Washington, Smyth Co | Dark moist soil and litter, spruce-birch forests. | S | G1G2 | S1S2 | - |
| **Springtail (Insect, Order Collembola)** | | | | | | | | | | |
| 1 | X | - | *Pygmarrhopalites sacer* | A cave springtail | Bath Co | Caves. | S | G2 | S2 | - |
| **Dragonfly (Insect, Order Odonata)** | | | | | | | | | | |
| 1 | X | X | *Hylogomphus viridifrons* | Green-faced clubtail | New R, Craig Ck, Pound R, Locust Spring | Aquatic-rivers. Formerly: *Gomphus viridifrons*. | S | G3G4 | S2 | S3 |
| 1 | - | X | *Ophiogomphus howei* | Pygmy snaketail | Upper New R; Carroll, Grayson, Wythe Cos | Aquatic-rivers. | S | G3 | S1S2 | - |

| OAR | GW | J | Species Name | Common Name | Range on or near GWJNFs | Habitat - Detail | TES | GRank | VA SRank | WV SRank |
|---|---|---|---|---|---|---|---|---|---|---|
| **Stonefly (Insect, Order Plecoptera)** | | | | | | | | | | |
| 1 | - | X | *Allocapnia fumosa* | Smokies snowfly | High elevation rheocrenes (flowing springs) of Mt. Rogers. Grayson, Smyth Cos. | Aquatic-streams. | S | G2 | S1S2 | - |
| 1 | - | X | *Megaleuctra williamsae* | Smokies needlefly | Mt Rogers & Whitetop Mtn | Aquatic-streams. | S | G2 | S1S2 | - |
| 1 | - | X | *Taeniopteryx nelsoni* | Cryptic willowfly | Lewis Fk & Grindstone Branch N of Mt Rogers | Aquatic-streams. | S | G1 | S1 | - |
| **Beetle (Insect, Order Coleoptera)** | | | | | | | | | | |
| 3 | X | X | *Cicindela patruela* | Northern barrens tiger beetle | Blue Ridge, Ridge & Valley | Eroded slopes of exposed sandstone and conglomerate. | S | G3 | S2 | S2S3 |
| 10 | - | - | *Pseudanophthalmus avernus* | Avernus Cave beetle | Endemic to Endless Caverns (commercial cave, non-FS) Rockingham Co. | Caves. | S | G1 | S1 | - |
| 1 | - | X | ***Pseudanophthalmus cordicollis*** | Little Kennedy Cave beetle | Franklins Pit, Little Kennedy Cave, Omega Cave System, Wildcat Saltpetre Cave, Wise Co., VA | Caves. | S | G1 | S1 | - |
| 1 | X | - | *Pseudanophthalmus intersectus* | Crossroads Cave beetle | Known only from Crossroads Cave, Millboro Springs, Bath Co. | Caves. | S | G1G2 | S1 | - |
| **Scorpionfly (Insect, Order Mecoptera)** | | | | | | | | | | |
| 1 | - | X | *Brachypanorpa jeffersoni* | Jefferson's short-nosed scorpionfly | Sugar Run Mountain, Giles Co; Whitetop Mtn, Smyth Co. | Moist soil around seeps. Only known from high elevation. Larvae use short burrows in loose soil and moss. | S | G2 | S1S2 | - |
| **Butterfly, Skipper, Moth (Insect, Order Lepidoptera)** | | | | | | | | | | |
| 1 | - | X | *Atrytone arogos* | Arogos skipper | Historic records, Blacksburg area. Caldwell Fields records need to be verified. | Relatively undisturbed grasslands, prairies, sand prairies, serpentine barrens, grassland/herbaceous, old field. Larval host plant; big bluestem *Andropogon gerardi.* | S | G3 | SH | - |
| 1 | X | X | *Calephelis borealis* | Northern metalmark | Alleghany, Augusta, Bath, Botetourt, Craig, Lee, Montgomery, Russell, Scott Cos: Historic records from Giles, Rockbridge Cos. | Openings within forested or wooded areas, natural outcrops, shale or limestone barrens, glades or powerline right of ways. Larvae host plant; round-leaf ragwort, *Senecio obovatus.* | S | G3G4 | S3 | S1 |
| 1 | X | X | *Callophrys irus* | Frosted elfin | Frederick, Montgomery, Page, Roanoke Cos. | Dry, open woods, clearings, and road/powerline ROWs with abundant wild indigo, *Baptisia tinctoria*. | S | G3 | S2? | S1 |
| 6 | X | X | *Danaus plexippus* | Monarch | Blue Ridge, Ridge & Valley | Mixed hardwood/conifer forest; shrubland; grassland/herbaceous; old field; suburban/orchard; cropland/hedgerow. Larval host plant; milkweeds *Asclepias* spp. | S | G4 | S4 | S2B |
| 1 | X | X | Erora laeta | Early hairstreak | Bedford, Botetourt, Page, Rockbridge, Warren, Wise Cos., VA; Monroe, Pendleton Cos., WV. Historic records from Giles, Montgomery Cos. | Hardwood forests or hardwood-northern conifer mixed forests. Larval host food, young fruit of American beech, *Fagus grandifolia*, nuts of beaked hazelnut *Corylus cornuta*. Canopy dweller. | S | GU | S2 | S2 |
| 2 | X | X | *Speyeria idalia* | Regal fritillary | Blue Ridge, Ridge & Valley | Riparian, grasslands-shrublands. Larval host plant, violets, *Viola* spp. | S | G3 | S1 | SH |
| 1 | X | X | *Erynnis martialis* | Mottled duskywing | Historic records from Augusta, Bedford, Botetourt, Craig, Montgomery, Rockbridge Cos.; St. Mary's R near entrance to Wilderness Area, Augusta Co. | Open woodland; barrens; open brushy fields. Larval host plant; New Jersey tea *Ceanothus americanus*. | S | G3 | S1S3 | S1 |

| OAR | GW | J | Species Name | Common Name | Range on or near GWJNFs | Habitat - Detail | TES | GRank | VA SRank | WV SRank |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | X | X | *Erynnis persius persius* | Persius duskywing | Blue Ridge, Ridge & Valley | Bogs, wet meadows, open seepages in boreal forests. Larval host plant; lupine, *Lupinus perennis*, wild indigo, *Baptisia tinctoria*. | S | G5T1T3 | S1 | - |
| 3 | X | - | *Pyrgus centaureae wyandot* | Appalachian grizzled skipper | Ridge & Valley | Shale barrens, open shaley oak woodlands. Larval host plant; cinquefoil, *Potentilla* spp, strawberry, *Fragaria virginina.* | S | G1G2Q | S1 | S1 |
| 1 | X | X | *Catocala herodias gerhardi* | Herodias underwing | Bald Knob, Bath Co; Poverty Hollow, Montgomery Co; Sand Mtn, Wythe Co (non FS property) | Pitch pine/bear oak scrub woodlands, >3000'. Larval host plant; oak, *Quercus* spp. | S | G3T3 | S2S3 | SU |
| 1 | - | X | *Catocala marmorata* | Marbled underwing | Montgomery Co | Mesic montane hardwood forests; Forested wetland, riparian. Larval host plants; willows/cottonwoods, *Salix/Populus*. | S | G3G4 | S2 | - |
| 1 | X | - | *Euchlaena milnei* | Milne's euchlaena moth | Warm Springs Mtn, Catawba Creek Slopes, Sweet Spring Hollow, Salt Pond Mtn. (Doe Creek) | Moist, forested slopes of mixed pine hardwoods. Acidic oak woods. | S | G2G4 | S2 | S1 |
| **Bee (Insect, Order Hymenoptera)** | | | | | | | | | | |
| | X | X | *Bombus affinis* | Rusty-patched bumble bee | Bath Co, VA: new location on Warm Springs RD, Duncan Knob found 6/2017. Following VA/WV county occurrences historic (Alleghany, Carroll, Frederick, Giles, Grayson, Montgomery, Nelson, Page, Pulaski, Rockbridge, Rockingham, Wythe Cos., VA; Hardy, Hampshire, Monroe, Pendleton, Pocahontas Cos, WV). | Habitat generalist: grasslands, old field, mature woods, open woodlands, mixed farmland edges, marshes, urban areas. Feeds from a variety of plants for pollen and nectar, including flowering rhododendron and mountain laurel. Nest sites include abandoned rodent burrows, fallen dead wood, stumps. Queen only overwinters. | E | G1 | S1 | S1 |
| **NON-VASCULAR PLANT** | | | | | | | | | | |
| **Lichen** | | | | | | | | | | |
| 1 | - | X | *Alectoria fallacina* | Witch's-hair lichen | Smyth, Grayson Co | S. Appalachian endemic. Conifer trees, especially fir rarely on birch, in spruce-fir forests; rarely fire cherry communities. | S | G2 | SH | SNR |
| | - | X | *Gymnoderma lineare* | Rock gnome lichen | Whitetop Mtn | Spruce-fir forests. | E | G2 | S1 | - |
| 2 | X | X | ***Heterodermia appalachensis*** | Appalachian shield lichen | St. Mary's Wilderness, Augusta Co.; Skidmore Fork, Rockingham Co.; Browns Run, Page Co.; rock outcrop, 6 mi. SE of Edinburg, Page Co.; summit of Whitetop Mt, Washington Co. | Bark of hardwoods, occasionally on shaded rocks. | S | G2? | S1 | - |
| 1 | - | X | *Heterodermia erecta* | A foliose lichen | Along Whitetop access road, 1.2 mile from summit, Grayson Co., VA. | S. Appalachian endemic. | S | G1? | S1 | - |
| 1 | - | X | *Hypotrachyna oostingii* | A foliose lichen | Mount Rogers, on Smyth, Grayson Co. line | Spruce-fir forests. | S | G2? | SU | - |
| 1 | - | X | *Hypotrachyna virginica* | Virginia hypotrachyna lichen | Mt Rogers & Whitetop Mtn | Spruce-fir forests. Found on spruce, fir, rhododendron in spruce-fir and fire-cherry communities in S. Appalachian Mtns. Typically at higher elevations, has been found at lower elevations. | S | G1G2 | SH | SNR |
| 1 | - | X | *Lecanora masana* | A lichen | Whitetop Mtn, and Grayson, Smyth Cos | S. Appalachian endemic. Spruce-fir, northern hardwood-conifer forest. | S | GNR | - | - |
| 1 | X | - | *Melanelia culbersonii* | Culberson's Black-parmelia | Massanutten (Fridley watershed) Rockingham Co; along trail from Wolf Gap Campground to Big Schloss, Shenandoah Co. | Rocks in open areas and on talus slopes. Fully exposed, minimally weathered quartzite and sandstone boulderfields at elevations from about 1000-3300 ft. | S | G2 | S4 | - |
| **Liverwort** | | | | | | | | | | |
| 1 | - | X | *Bazzania nudicaulis* | A liverwort | Mt Rogers & Whitetop Mtn | Bark and rock outcrops in spruce-fir forests. | S | G2G3 | S? | - |

| OAR | GW | J | Species Name | Common Name | Range on or near GWJNFs | Habitat - Detail | TES | GRank | VA SRank | WV SRank |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | X | - | *Cephaloziella spinicaulis* | A liverwort | Along SR 33, 10 miles W of Harrisonburg. | Damp soil in crevices of shaded sedimentary rocks, in hemlock-hardwoods forest and humid to dry faces of ledges and cliffs in open oak-hickory forest. | S | G3G4 | SNR | - |
| 1 | - | X | *Leptoscyphus cuneifolius* | Wedge Flapwort | Grayson Co | Bark of Fraser fir. | S | G4G5 | SH | - |
| 2 | - | X | *Nardia lescurii* | A liverwort | Blue Ridge, Ridge & Valley | Riparian - on peaty soil over rocks, usually in shade and associated with water, <3000'. | S | G3? | S1 | - |
| 1 | - | X | *Plagiochila austinii* | A liverwort | Little Stony Ck – Cascades; Red Ck on Beartown Mtn | Rich, moist, densely forested ravines; shaded outcrops. | S | G3 | S? | - |
| 1 | - | X | *Plagiochila corniculata* | A liverwort | Grayson, Smyth Cos | Limited to densely shaded, humid, often fog-enshrouded mountain summits, usually to the spruce-fir association. Most commonly found on Fraser fir. | S | G4? | SNR | - |
| 1 | - | X | *Plagiochila sullivantii var. sullivantii* | A liverwort | Whitetop Mtn, Salt Pond Mtn | Moist shaded rock outcrops, under cliff ledges, in crevices. | S | G2T2 | SNR | - |
| 1 | X | X | *Plagiochila virginica* | A liverwort | Bath, Giles, Highland, Roanoke Cos | S. Appalachian endemic. Damp to intermittently dry calcareous or sandstone ledges or cliffs in partially exposed sites. | S | G3 | SNR | SNR |
| 1 | X | X | *Radula tenax* | A liverwort | Alleghany, Amherst, Dickenson, Giles, Highland, Nelson, Smyth, Washington Cos | Moist rocks or trees in mountains below spruce-fir zone; Depressed, dense mats on moist rocks, less frequently on tree trunks, in mountainous and hilly regions. Two discrete modes of occurrence: on shaded, damp rocks, and on tree bark in deep, moist forests. Does not tolerate submersion. | S | G3G4 | SU | SNR |
| 1 | - | X | *Sphenolobopsis pearsonii* | A liverwort | Mt Rogers & Whitetop Mtn | Bark of Fraser fir, mountain ash, occasionally on red spruce, >5000'. | S | G2 | S? | - |
| **Moss** | | | | | | | | | | |
| 1 | - | X | *Sphagnum flavicomans* | Northeastern peatmoss | Whitetop Mtn | Bogs, seeps. | S | G3 | SU | - |
| **VASCULAR PLANT** | | | | | | | | | | |
| 1 | - | X | *Abies fraseri* | Fraser fir | Grayson, Smyth Cos | S. Appalachian endemic. Spruce–fir forests, bogs >5000' | S | G2 | S1 | SNA |
| 2 | X | X | *Aconitum reclinatum* | Trailing white monkshood | Blue Ridge, Ridge & Valley | Rich cove sites, streambanks, seepages; all with high pH. | S | G3G4 | S3 | S3 |
| 1 | - | X | *Actaea rubifolia* | Appalachian black cohosh | Lower Clinch R watershed, Scott, Wise Cos | Moist, rich wooded bluffs over limestone. | S | G3 | S1 | - |
| 1 | X | X | *Allium oxyphilum* | Nodding onion | Monroe, Summers, Mercer, Greenbrier Cos, WV | Shale barrens, sandstone glades. | S | G2 | S1 | S2 |
| 1 | X | - | *Arabis patens* | Spreading rockcress | Frederick, Lee, Page, Shenandoah, Warren Cos, VA; Hampshire, Hardy, Pendleton Cos, WV | Shaded, calcareous cliffs, bluffs, and talus slopes. | S | G3 | S1 | S2 |
| 3 | X | X | *Berberis canadensis* | American barberry | Blue Ridge, Ridge & Valley | Calcareous open woods, bluffs, cliffs, and along fencerows. | S | G3 | S3S4 | S1 |
| | - | X | *Betula uber* | Virginia round-leaf birch | One location: Cressy Ck, Smyth Co. | Riparian, mixed open forest, usually disturbed sites. | T | G1Q | S1 | - |
| | X | - | *Boechera serotina* | Shale barren rockcress | Ridge & Valley N of James R watershed | Shale barrens and adjacent open oak woods. | E | G2 | S2 | S2 |
| 1 | X | - | *Boltonia montana* | Mountain doll's-daisy | Augusta Co | Sinkhole ponds. | S | G1G2 | S1 | - |
| 1 | - | X | *Botrychium jenmanii* | Alabama Grapefern | Russell & Wise Cos. | Open woods, old fields, pastures. Formerly: *Sceptridium jenmanii* | S | G3G4 | SH | - |

| OAR | GW | J | Species Name | Common Name | Range on or near GWJNFs | Habitat - Detail | TES | GRank | VA SRank | WV SRank |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | X | X | *Buckleya distichophylla* | Piratebush | Blue Ridge S of Roanoke R, Ridge & Valley S of James R | Open oak and hemlock woods. | S | G3 | S2 | - |
| 2 | - | X | *Cardamine clematitis* | Mountain bittercress | Blue Ridge, Ridge & Valley, S of New R watershed | Riparian, spring seeps, rocky streamsides. | S | G3 | S1 | - |
| 3 | X | X | *Carex polymorpha* | Variable sedge | Blue Ridge, Ridge & Valley, N of James R | Open acid soil, oak-heath woodlands, responds positively to fire. | S | G3 | S2 | S1 |
| 1 | X | X | *Carex schweinitzii* | Schweinitz's sedge | Augusta, Bath, Highland, Montgomery, Pulaski, Washington Cos | Bogs, limestone fens, marl marshes. | S | G3G4 | S1 | - |
| 1 | - | X | *Chelone cuthbertii* | Cuthbert turtlehead | Blue Ridge Plateau, Grayson, Carroll Cos | Bogs, wet meadows, boggy woods and thickets. | S | G3 | S2 | - |
| 1 | - | X | *Cleistesiopsis bifaria* | Small spreading pogonia | Craig, Dickenson, Scott, Wise Cos | Well drained, rather open, scrubby hillsides, oak-pine-heath woodlands, acidic soils. Formerly: *Cleistes bifaria.* | S | G4? | S2 | S1 |
| 1 | - | X | *Clematis addisonii* | Addison's leatherflower | Montgomery, Roanoke, Botetourt, Rockbridge Cos | Open glades & rich woods over limestone and dolostone. | S | G1? | S2 | - |
| 3 | X | X | *Clematis coactilis* | Virginia white-haired leatherflower | Ridge & Valley, Rockbridge Co, S to Wythe Co | Shale barrens, rocky calcareous woodlands. | S | G3 | S3 | - |
| 1 | X | - | *Clematis viticaulis* | Millboro leatherflower | Endemic to VA, only in Bath, Rockbridge Cos. | Shale barrens, open shaly woodlands. | S | G1 | S1 | - |
| 1 | X | X | *Corallorhiza bentleyi* | Bentley's coralroot | Alleghany, Bath, Giles Cos VA; Monroe, Pocahontas Cos WV | Dry, acid woods, along roadsides, well-shaded trails. | S | G2 | S2 | S1 |
| 2 | X | X | *Delphinium exaltatum* | Tall larkspur | Blue Ridge, Ridge & Valley | Dry calcareous soil in open grassy glades or thin woodlands. | S | G3 | S3 | S2 |
| 1 | X | - | *Echinodorus tenellus* | Dwarf burhead | Pines Chapel Pond, Augusta Co | Pond margins, wet depressions in sandy soil. | S | G5? | S1 | - |
|  | X | X | *Echinacea laevigata* | Smooth coneflower | Alleghany, Montgomery Cos | Open woodlands and glades over limestone or dolomite. | E | G2G3 | S2 | - |
| 2 | X | X | *Euphorbia purpurea* | Glade spurge | Blue Ridge, Ridge & Valley | Rich, swampy woods, seeps and thickets. | S | G3 | S2 | S2 |
| 1 | X | X | *Gaylussacia brachycera* | Box huckleberry | Alleghany, Bath, Bland, Carroll, Craig, Dickenson, Montgomery Cos | Dry, acidic forests, woodlands of oaks, pines, and other heaths. | S | G3 | S1 | S2 |
| 2 | X | X | *Gymnocarpium appalachianum* | Appalachian oak fern | Alleghany, Augusta, Bath, Highland, Page, Rockbridge, Rockingham, Warren Cos | Maple-birch-hemlock woods on mountain slopes and summits, moist sandstone, talus slopes, or bouldery colluvium. Requires cool, moist microclimate, typically on north-facing slopes with cold air seepage >2000'. | S | G3 | S3 | S2 |
|  | X | - | *Helenium virginicum* | Virginia sneezeweed | Endemic to Augusta, Rockingham Cos. | Seasonally dry meadows and sinkhole depressions. | T | G3 | S2 | - |
|  | X | - | *Helonias bullata* | Swamp-pink | Augusta, Nelson Cos | Sphagnum bogs, seeps, and streamsides. | T | G3 | S2S3 | - |
| 3 | X | - | *Heuchera alba* | White alumroot | Shenandoah Mtn | High elevation rocky woods and bluffs. | S | G2Q | S1 | S2 |
| 2 | X | X | *Ilex collina* | Long-stalked holly | Blue Ridge, Ridge & Valley | Bogs, seep, shrubby streamheads, >3100'. | S | G3 | S1 | S2 |
|  | - | X | *Iliamna corei* | Peter's Mountain-mallow | One location: Narrows, Peters Mountain, Giles Co. | Rich, open woods along sandstone outcrops, soil pockets, fire maintained. | E | G1 | S1 | - |
|  | X | X | *Isotria medeoloides* | Small whorled pogonia | In mountains of VA known only from Bedford, Craig, and Lee Cos; other VA occurrences in Piedmont & Coastal Plain. | Open, mixed hardwood forests on level to gently sloping terrain with north to east aspect. | T | G2? | S2 | S1 |

| OAR | GW | J | Species Name | Common Name | Range on or near GWJNFs | Habitat - Detail | TES | GRank | VA SRank | WV SRank |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | X | X | *Juglans cinerea* | Butternut | Blue Ridge, Ridge & Valley | Well-drained bottomland and floodplain, rich mesophytic forests, mostly along toeslopes. | S | G4 | S3? | S3 |
| 3 | X | X | *Liatris helleri* | Turgid gayfeather | Blue Ridge, Ridge & Valley | Shale barrens, mountain hillside openings. *L.turgida* synonymous with *L. helleri.* | S | GNR | S3 | SNR |
| 1 | - | X | *Lilium grayi* | Gray's lily | Blue Ridge, Mt Rogers & Whitetop Mtn (occurrences north of Floyd Co questionable). | Bogs, open seeps, wet meadows, grassy balds. | S | G3 | S2 | - |
| 3 | X | X | *Monotropsis odorata* | Sweet pinesap | Blue Ridge, Ridge & Valley | Dry oak-pine-heath woodlands, soil usually sandy. | S | G3 | S3 | S1 |
| 1 | - | X | *Packera millefolium* | Piedmont ragwort | Lee, Scott Cos | Open limestone outcrops and cedar barrens. | S | G3 | S2 | - |
| 1 | X | X | *Parnassia grandifolia* | Largeleaf grass-of-Parnassus | Augusta, Bland, Giles, Grayson, Lee, Montgomery, Russell, Washington, Wythe | Fens, thinly wooded, gravelly seeps over limestone, dolomite, amphibolite, and ultramafic rocks; restricted to calcareous or magnesium-rich soils. | S | G3 | S2 | S1 |
| 2 | X | - | *Paxistima canbyi* | Canby's mountain lover | Ridge & Valley, Sarver Barrens SBA, Craig Co | Calcareous cliffs and bluffs, usually undercut by stream. | S | G2? | S2 | S2 |
| 2 | X | X | *Phemeranthus teretifolius* | Quill fameflower | Amherst, Augusta (west side of Blue Ridge, near Laurel Springs Gap, Humpback Mtn SBA), Bedford, Carrol, Craig (Bald Mtn SBA), Grayson, Montgomery, Nelson, Page, Roanoke, Rockingham, Warren Cos, VA; Hardy & Hampshire Cos, WV | Calcareous sandstone glades, metabasalt barrens. Also Roundleaf fameflower, *Talinum teretifolium*. | S | G4 | S4 | S1 |
| 3 | X | X | *Phlox buckleyi* | Sword-leaf phlox | Blue Ridge, Ridge & Valley | Open, often dry oak woodlands and rocky slopes, usually over shale in humus rich soils, often along roadsides. | S | G2 | S2 | S2 |
| 2 | X | X | *Poa paludigena* | Bog bluegrass | Blue Ridge, Ridge & Valley | Shrub swamps and seeps, usually under shade. | S | G3G4 | S2 | S1 |
| 1 | X | - | *Potamogeton hillii* | Hill's pondweed | Bath Co | Clear, cold calcareous ponds. | S | G3 | S1 | - |
| 2 | X | - | *Potamogeton tennesseensis* | Tennessee pondweed | Ridge & Valley | Ponds, back water of streams and rivers. | S | G2G3 | S1 | S2 |
| 1 | X | X | *Pycnanthemum torreyi* | Torrey's mountain-mint | Bland, Bath, Giles, Rockbridge, Wythe Cos | Open, dry rocky woods, roadsides, and thickets near streams, heavy clay soil over calcareous rock. | S | G2 | S2 | S1 |
|  | X | X | *Scirpus ancistrochaetus* | Northeastern bulrush | Ridge & Valley | Mountain ponds, sinkhole ponds in Shenandoah Valley. | E | G3 | S2 | S1 |
| 3 | X | X | *Scutellaria saxatilis* | Rock skullcap | Blue Ridge, Ridge & Valley | Rich, dry to mesic ridgetop woods, 32 counties in VA, likely G4/S4. | S | G3G4 | S3 | S2 |
| 1 | - | X | *Silene ovata* | Mountain catchfly | Dickenson, Lee, Wise Cos | Rich woodlands and forests over limestone. | S | G3 | S1 | - |
|  | - | X | *Spiraea virginiana* | Virginia spiraea | Blue Ridge, Ridge & Valley, S of New R | Scoured banks of streams, riverside or island shrub thickets. | T | G2 | S1 | S1 |
| 1 | X | X | *Thermopsis mollis* | Soft-haired thermopsis | Amherst, Bath, Bedford, Botetourt, Montgomery, Rockbridge Cos | Dry, open forests, woodlands, and clearings. Also Allegheny Mountain Golden-banner. | S | G3G4 | S3 | - |
| 3 | X | X | *Trifolium virginicum* | Kate's Mountain clover | Alleghany, Augusta, Bath, Botetourt, Craig, Frederick, Highland, Rockbridge, Rockingham, Shenandoah, Warren Cos | Shale barrens. | S | G3 | S3 | S3 |
| 1 | - | X | *Tsuga caroliniana* | Carolina hemlock | Blue Ridge north to James R. | Rocky ridges and slopes, usually dry and well drained. | S | G2G3 | S3 | - |

| OAR | GW | J | Species Name | Common Name | Range on or near GWJNFs | Habitat - Detail | TES | GRank | VA SRank | WV SRank |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | X | X | *Vitis rupestris* | Sand grape | Ridge & Valley | Scoured banks of rivers and streams over calcareous bedrock. | S | G3 | S1 | S2 |

## LEGEND FOR TES SPECIES LIST IN OCCURRENCE ANALYSIS RESULTS:

**OAR CODES:**

1 = Project located out of known species range.

2 = Lack of suitable habitat for species in project area.

3 = Habitat present, species was searched for during field survey, but not found.

4 = Species occurs in project area, but outside of activity area.

5 = Field survey located species in activity area.

6 = Species not seen during field survey, but possibly occurs in activity area based on habitat observed; or field survey not conducted when species is recognizable (time of year or time of day). Therefore assume presence and no additional surveys needed.

7 = Aquatic species or habitat known or suspected downstream of project/activity area, but outside identified geographic bounds of water resource cumulative effects analysis area (defined as point below which sediment amounts are immeasurable and insignificant).

8 = Aquatic species or habitat known or suspected downstream of project/activity area, but inside identified geographic bounds of water resource cumulative effects analysis area.

9 = Project occurs in a 6th level watershed included in the USFWS/FS T&E Mussel and Fish Conservation Plan (August 8, 2007 U.S. Fish & Wildlife Service concurrence on updated watersheds). Conservation measures from the USFWS/FS T&E Mussel and Fish Conservation Plan applied.

10 = Historic records for this species only; or no known records on GWJ; or species considered extirpated from Virginia/West Virginia.

11 = Habitat present within project area, species known or suspected to occur in activity area. However, project design and mitigation measures result in no effect or no impact for this species, since activities will occur when species is either dormant or not in the project area due to time of year activities will occur, and/or activities will not impact habitat components species are known to utilize for their life cycle needs. (NOTE: When using this code, the Biological Evaluation or Biological Assessment should include an explanation of the analysis used. *E.g.*, How are the impacts of the action limited temporally to not cause an impact when the species returns or breaks dormancy?)

**SPECIES:** The term "species" includes any subspecies of fish, wildlife or plants, and any distinct population segment of any species or vertebrate fish or wildlife, which interbreeds when mature (Endangered Species Act of 1973, as amended through the 100th Congress).

**RANGE:** The geographical distribution of a species. For use here "range" is expressed as where a species is known or expected to occur on or near the George Washington and Jefferson National Forests in terms of landform (feature name, physiographic province), political boundary (county name), or watershed (river, or stream name).

**HABITAT:** A place where the physical and biological elements of ecosystems provide a suitable environment and the food, cover and space resources needed for plant and animal livelihood (FSM 2605-91-8, pg. 10 of 13).

**TES CODES:**

T = Federally listed as Threatened

E = Federally listed as Endangered

P = Federally Proposed as T or E

S = Southern Region (R8) Sensitive species

**GLOBAL RANK:** Global ranks are assigned by a consensus of the network of natural heritage programs, scientific experts, NatureServe and The Nature Conservancy to designate a rarity rank based on the range-wide status of a species or variety. This system was developed by The Nature Conservancy and is widely used by other agencies and organizations as the best available scientific and objective assessment of taxon rarity and level of threat to its existence. The ranks are assigned after considering a suite of factors including number of occurrences, numbers of individuals, and severity of threats.

G1 = Extremely rare and critically imperiled with 5 or fewer occurrences or very few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.

G2 = Very rare and imperiled with 6 to 20 occurrences or few remaining individuals; or because of some factor(s) making it vulnerable to extinction.

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range; or vulnerable to extinction because of other factors. Usually fewer than 100 occurrences are documented.

G4 = Common and apparently secure globally, although it may be rare in parts of its range, especially at the periphery.

G5 = Very common and demonstrably secure globally, although it may be rare in parts of its range, especially at the periphery.

GH = Formally part of the world's biota with the exception that may be rediscovered.

GX = Believed extinct throughout its range with virtually no likelihood of rediscovery.

GU = Possibly rare, but status uncertain and more data needed.

G? = Unranked, or, if following a ranking, ranking uncertain (ex. G3?).

G_G_ = The rank is uncertain, but considered to be within the indicated range (e.g., G2G4) of ranks (also T_T_).

G_Q = Taxon has a questionable taxonomic assignment, (e. g., G3Q) and may prove to be invalid upon further study.

G_T = Signifies the rank of a subspecies (e. g., G5T1 would apply to a subspecies of a species is demonstrably secure globally (G5) but the subspecies warrants a rank of T1, critically imperiled.)

GNR = A global conservation status rank has not been assigned to the species.

**STATE RANK**: The following ranks are used by the Virginia Department of Conservation and Recreation to set protection priorities for natural heritage resources. Natural Heritage Resources (NHRs) are rare plant and animal species, rare and exemplary natural communities, and significant geologic features. The criterion for ranking NHRs is the number of populations or occurrences, i.e. the number of known distinct localities; the number of individuals in existence at each locality or, if a highly mobile organism (e.g., sea turtles, many birds, and butterflies), the total number of individuals; the quality of the occurrences, the number of protected occurrences; and threats.

- **S1** – Extremely rare and critically imperiled with 5 or fewer occurrences or very few remaining individuals in Virginia; or of some factor(s) making it especially vulnerable to extirpation in Virginia.
- **S2** – Very rare and imperiled with 6 and 20 occurrences or few remaining individuals in Virginia; or with many individuals in fewer occurrences; or of some factor(s) making it vulnerable to extirpation in Virginia.
- **S3** – Rare to uncommon in Virginia with between 21 and 100 occurrences; may have fewer occurrences if found to be common or abundant at some of these locations; may be somewhat vulnerable to extirpation in Virginia.
- **S4** – Common and apparently secure in Virginia, although it may be rare in parts of its range.
- **SH** – Formerly part of Virginia's fauna/flora with some expectation that it may be recovered; generally applies to species that have not been verified in Virginia for an extended period (usually > 15 years) amd for which some inventory has been attempted recently.
- **SX** – Believed to be extirpated from Virginia with virtually no likelihood of rediscovery.
- **SU** – Possibly rare, but status uncertain and more data needed. Currently unrankable, due to lack of information or due to substantially conflicting information about status or trends; often because of low search effort or cryptic nature of the element.
- **S#B** – Breeding status of an animal (primarily used for birds/butterflies) in Virginia; these species typically inhabit Virginia only during the breeding season.
- **S#B/S#N** – Breeding and non-breeding status of an animal (primarily used for birds) in Virginia, when they differ.
- **SNA** – A conservation status rank not applicable because the species is not a suitable target for conservation activities in Virginia (includes accidental species, transients, exotics etc.).
- **SNR** – A state conservation status rank has not been assigned to the species.

**These ranks should not be interpreted as legal designations**.